The instrument should be gas calibrated on a monthly basis. Use the "Monthly Gas Calibration Log", EMS Document Control No. RDD-F-GM-13 to log calibration.

WARNING: *The GEM-2000 is not certified as intrinsically safe. The following procedure* ***MUST NOT*** *be done in a confined space (such as well vaults, underground and indoors) or where there is any chance of sparking or ignition. No smoking, exposed lighting , or other sources of ignition should be in the area. On the GEM-2000, ensure that the exhaust gas is safe, not blocked and properly vented away from you. Ensure that no leaks are present. Unless all above conditions are maintained, an explosion could occur resulting in serious injury or death.*

Instrument Set up:

1. Connect the calibration gas cylinder to the pressure regulator. For methane and carbon dioxide calibration use gas mixture of 50% methane, 35% carbon dioxide and for oxygen calibration use gas mixture of 2% oxygen, balance nitrogen.
2. Connect the pressure regulator to a 1 liter Tedlar bag using 24" of 1/8" Tygon tubing.
3. Fully open the Tedlar bag fill/sample valve, then slowly open the pressure regulator valve and allow the gas mixture to flow into the Tedlar bag. Once the Tedlar bag is full, shut the valves on the pressure regulator and on the tedlar bag. ***(Note: Do not overfill the Tedlar bag, overfilling will rupture the bag.)***
4. Connect one end of 1/8" Tygon tubing to the Tedlar bag and one end to the sample inlet of GEM 2000, use 1/8" quick disconnect to connect tubing to GEM 2000.
5. Once instrument is on the appropriate screen, start opening the Tedlar bag fill/sample valve slowly and follow steps below.

Methane and Carbon Dioxide Calibration Procedure:

1. Turn instrument on and press **key 1-Menu.**
2. From main menu, scroll down to select **Field Calibration**.
3. **Zero the methane** as follows:
   a. Connect ***a zero CH_4 gas mixture*** to the instrument following the set up procedure above and allow calibration gas mixture to flow slowly into GEM inlet port by opening the Tedlar Bag fill/sample valve, you may use 2.0% O_2/balance nitrogen. Allow gas to flow for at least 30 seconds or until reading stabilizes.
   b. Press ⇐ **Calibration Menu**, then **Zero Channels**.
   c. Press ⇐ **Zero CH_4** .
4. Connect 50% CH_4, 35% CO_2 gas mixture to GEM 2000 following the set up procedure above and allow calibration gas mixture to flow slowly into GEM inlet port by opening the Tedlar Bag fill/sample valve.
5. Allow gas to flow for 30 seconds, then **Span gases** as follows:

a. Press **3-Edit Target Concentrations,** then enter gas concentrations by key in percentages as three digits for each gas in the corresponding column under **row S.** After keying in each value press ↵. ***Note**: key in 02.0 for* O_2 value.

b. Press ↵ **Calibration Menu**, then scroll down and press ↵to select **Span Channels**.

c. Press ↵to select Span CH_4 @ 50%, screen will prompt a message "calibration complete.

d. Scroll down to select Span CO_2 @ 35%, screen will prompt a message "calibration complete.

e. Scroll down to select Span O_2 @ 2.0%, screen will prompt a message "calibration complete.

6. Continue allowing gas to flow into the instrument and check current readings (row R). If current reading is within ±0.5% of calibration gas concentration, calibration is satisfactory.

7. If current reading is greater than ±0.5% range, repeat span calibrations again.

Oxygen Calibration Procedure:

1. Turn instrument on and press **key 1-Menu.**

2. From main menu, scroll down to select **Field Calibration**.

3. **Zero the oxygen** as follows:

   a. Connect ***a zero O_2 gas mixture*** to the instrument following the set up procedure above and allow calibration gas mixture to flow slowly into GEM inlet port by opening the Tedlar Bag fill/sample valve, you may use 50% CH_4, 35% CO_2, balance nitrogen gas mixture. Allow gas to flow for at least 30 seconds or until reading stabilizes.

   b. Press ↵ **Calibration Menu**, then **Zero Channels**.

   c. Scroll down and press ↵ **Zero O_2**.

4. Connect 2.0% O_2/balance nitrogen gas mixture to GEM 2000 following the set up procedure above and allow calibration gas mixture to flow slowly into GEM inlet port by opening the Tedlar Bag fill/sample valve.

5. Allow gas to flow for 30 seconds, then **Span gases** as follows:

   a. Press ↵ **Calibration Menu**, then scroll down and press ↵to select **Span Channels**.

   b. Scroll down to select **Span O_2 @ 2.0%,** screen will prompt a message "calibration complete".

* **Note**: you should not need to enter (key in) the span target values since this step was done already, (5a, under Methane and CO_2 calibration.)

6. Continue allowing gas to flow into the instrument and check current readings (row R). If current reading is within ±0.5% of calibration gas concentration, calibration is satisfactory. * **Note**: Since gas mixture does not have CH_4 & CO_2, it should read zero for these values.
7. If current reading is greater than ±0.5% range, repeat span calibrations again.

Benefit of Compliance to Instruction:

- Provides quality assurance and quality control of field data
- Accurate field data is necessary in order to meet APCD permit conditions

Consequence of Non-Compliance to Instruction:

- Lack of calibration leads to inaccurate field measurements
- Violation of calibration SOP invalidates data and violates APCD permit.

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Approved by: Steven F. Fontana, *Deputy Environmental Services Director, Refuse Disposal*

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